

Designer Milk-Milk for Human Health Benefit

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ABSTRACT

Milk is an integral part of human and animal newborn nutrition and has drawn the attention of food technologists, physicians, and biochemists. Milk is regarded as a wholesome food and food filled with different beneficial nutrients. *Via* dietary alterations of milch animals, the milk composition can be changed in order to enhance human wellbeing. Milk with changed constituents has many human health applications.

Keywords: Designer milk, Animals; Food; Nutritional alteration; Nutritional management

INTRODUCTION

Among all the foods available, milk is a natural complete and balanced food, which is a rich source of fat, protein, essential vitamins and minerals. In particular, milk is a good source of calcium that is very much essential for the prevention of bone disorders such as osteoporosis and it is also necessary for the growth and development of new born young one, growing children's. In modern era consumers are very much aware about their health. So the demand of functional foods is increasing day by day at a global level. The optimistic views of increasing demand of Functional foods are also supported by number of institutions and health related organizations such as the American Dietetic Association.

To compete with the today's demand of human beings, milk has to be designed in such a way, which increases its properties according to the need of the changing scenario. Designer or enriched milk are those in which the content has been modified from the standard constituent of milk. Designer milk will give improved and value added products naturally with improved nutraceuticals to meet the requirement of new generations. Now a day's biotechnologists have identified genetic markers in cows for disease or desirable traits such as milk fat synthesis. So future perspective cow will produce low milk fat naturally, which can be achieved through combination of traditional genetics, marker assisted selection and genetic modification of dairy cattle and by farm and feed management. From Human Health point of view some of the desirable improvements are:

- Increased proportion of unsaturated fatty acids and low fat milk and its products
- Low lactose content
- Complete absence of b-lacto globulin from milk. Such type

of milk may be classified as humanized milk, milk with high therapeutic purpose.

Applications of designer milk

The applicability of designer milk can be classified into two categories i.e. in diet and human health measures as well as in processing/technological developments. Among applications of designer milk in diet and human health is that it generates a greater proportion of Unsaturated Fatty Acids (USFA) in milk fat, reduced lactose content that benefits lactose intolerant individuals and removal of β -lacto-globulin from milk. However, its applicability in processing and technological developments includes alteration of primary structure of casein to improve technological properties of milk, production of high-protein milk, accelerated curd clotting time for cheese manufacturing, increased yield and/or more protein recovery, milk containing nutraceuticals and replacement for infant formula etc.

Relation between nutrition and health

In order to strengthen the immune system for the prevention of various diseases and thereby to improve health, dietary strategies may be effective alternatives. In western and developing countries, consumption of milk and dairy products is increasing, but milk fat contains lauric, myristic and palmitic acids that increase the level of cholesterol, so it has a poor health impact, but some milk components such as conjugated linoleic acids, butyric acids and n-3 polyunsaturated fatty acids have health benefits and participate in chronic disease prevention. Whey proteins of milk also contain good amount of antimicrobials, such as lactoferrin, lactoperoxidase, lysozyme, and immunoglobulins. Casein protein, vitamins A, E, K and D, probiotics, different minerals (calcium, phosphate, potassium, magnesium, chloride) and energy are also present in milk.

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Nutritional alterations to produce the designer milk

Less than 10% polyunsaturated fatty acids, less than 8% saturated fatty acids and more than 82% monounsaturated fatty acids are the ideal milk fat for human wellbeing. At different stages, the milk components may be altered. Rumen microbiota is the source of bioactive fatty acids in ruminants, which are incorporated into animal milk and meat. Dietary ingredients have an effect on milk composition of animals. Altering the composition of milk by dietary interventions is feasible [1].

The proportion of potentially safe milk fatty acids, oleic acid, vaccenic acid, rumenic acid, alpha-linolenic acid, and total polyunsaturated fatty acids increased in the diet of lactating cows by supplementing canola, soybean oil and linseed rich in alpha-linolenic acid. In general, ruminant foods contain Polyunsaturated Fatty Acids (PUFAs), but ruminant products such as meat or milk contain saturated fatty acids and certain quantities of Conjugated Linoleic Acid (CLAs). This is due to the lipolysis of microbial enzymes and the bio-hydrogenation of rumen Polyunsaturated Fatty Acids (PUFA) [2]. The main rumen-grown bio-hydrogenation bacteria are *Butyrivibrio fibrisolvens*. Manoeuvring the rumen environment creates opportunities to alter the lipid composition of meat and milk by modifying the disposition of intramuscular and mammary tissue Fatty Acids (FA) for absorption [3]. Various probiotics or microbial feed supplements favourably alter lipid metabolism and modify milk composition. Phytometabolites such as tannins, polyphenol oxidase, essential oils, fatty acid oxygenation and saponins have various effects on the composition of the milk and increase the consistency of the milk. Pastured cow milk has a higher ratio of Essential Fatty Acids (EFAs) and grass-fed cow milk has higher conjugated linoleic acid than grain-fed animal milk. A varying number of microbiota or microbial metabolites of the rumen may also alter the composition of the milk. As the fatty acid composition of rumen microbiota is changed by the grazing regime, it can be used to change rumen microbial populations, thus changing the milk fatty acid profile [4]. With the dietary addition of fish oils or fish meal, changes in milk fat concentration of Conjugated Linoleic Acid (CLA) are also observed.

Benefits of designer milk

Eating designer milk has several health benefits that are:

- Reduce the problem of lactose intolerance by decreasing the

lactose level in designer milk

- By increasing omega- fatty acids in the designer milk lower the risk of cardiovascular disease, autoimmune disorders, allergies, obesity, and diabetes
- By minimizing saturated fats in the milk, lowering the incidences of obesity, cholesterol l levels, and cardiovascular diseases
- By altering protein contents, increasing casein to obtain an increase in cheese yield
- Phytosterol-enriched vitamin A milk decreases serum levels of triglycerides, low-density lipoprotein cholesterol, and apolipoprotein-B that have a detrimental effect on health

CONCLUSION

Consuming designer milk and milk products improves human health and well-being. Animal nutritional intervention, with an increasing interest in functional and nutraceutical foods, can easily help design milk with various functions and utility. Some important compounds like carotene, needed for normal body function cannot be synthesized by the human body can easily be fortified and supplemented by designer milk.

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